The pressure, in millimeters of water or kilograms per square meter, required to impress this velocity upon the gases would be:
With 3 valves:

$5_{2==}$ L:—X . , , • • - , = 7 kg 392 per square meter;

= 7 mm 392 of water.

With two valves:

$<j_2$ = 23.702 / meter; X 1.29 = lo kg 22 per square meter;

= 18 mm 22 of water.

The draft depression at the chimney valves was — 38 mm of water. Therefore, from 20 to 48 per cent of the draft at these points was required to supply a sufficient velocity to remove the waste gases. This would seem to indicate insufficient valve area. Two valves tend to strangulate the stove, but with three the strangulation is lessened. The chimney valve is a weak point; any leakage of blast at this point is effectually concealed. A multiplicity of valves increases the opportunity for valve defects, but at the same time permits blanking a valve, if necessary, without shutting down the stove for any length of time. Large valves are costly, but one large valve reduces the number of potential leakage points. The lowered velocity reduces the draft required in proportion to the square of the velocity, and the friction and other losses are likewise reduced.

The distribution of the gases through the checkerwork will not be affected by the number of chimney valves, clampers and partitions, but by the friction, heat loss, etc. The rapidity with which the current of gas gives up its heat in any particular checker-pass will determine the quantity of gas flowing in that pass. A mathematical demonstration of this is given in Groume-Grjimailo's work, and the distributions of the isotherms, as shown in Fig. 6 of Mr. Maccoun's paper, confirm this. The natural

velocity of convection currents is higher than is generally realized. Table No. 8, Appendix VI, gives the convection velocities for various average temperature differentials acting through heights of 0.10, 1.00 and 10.00 meters. The checkerwork is 24 meters high; the velocity average for the blast and the hot gases is 2 m 63 and 2 m 41 per second, which is less than the convection velocity for an average temperature differential of 10° acting for 10 m 00. The tempera-